Patent claims

1. A mobile phone terminal having
- a transmitter stage (7, 15a, 15b),
- a receiver stage (5, 17a, 17b),
- an antenna switch-over and adapter stage (11),

which each have an arrangement of passive structural elements, which arrangement is assigned a multiplicity of electrostatic-mechanical microswitches (MS_i-MS_m) or microrelays (MR_i, MR_j) and which can be programmed by actuating a predetermined configuration of the microswitches or microrelays in, in each case, at least one functional parameter, in particular the frequency characteristic, and
- a programmable control unit (9; 90; C) for actuating the microswitch or microrelay configuration for setting predetermined values of the functional parameter or the functional parameters.

2. The mobile phone terminal as claimed in claim 1, characterized in that at least one of the transmitter stage (7, 15a, 15b), receiver stage (5, 17a, 17b) and antenna switch-over and adapter stage (11) has a multiplicity of micromotors for mechanically adjusting passive structural elements, the micromotors (MM_1, MM_2) having a control connection to the control unit.

3. The mobile phone terminal as claimed in claim 1 or 2, characterized in that the control unit (90; C) has an on/off switch (90b; Sw) for the transmitter stage and the receiver stage and is embodied in such a way that, in each case before an actuation signal is transmitted to the microswitch configuration or microrelay configuration, and optionally to a micromotor, a switch-off signal is transmitted to the on/off switch in order to deactivate the transmitter stage and/or receiver stage (5; R/T).

4. The mobile phone terminal as claimed in claim 3, characterized in that the control unit (90) has a program-end sensing unit (90h) which is connected to the on/off switch (90b) and transmits, after the termination of a program run for setting one or more functional parameters, a switch-on signal to the on/off switch in order to activate the transmitter and/or receiver stage (5).

5. The mobile phone terminal as claimed in one of the preceding claims, characterized in that at least some of the microswitches or microrelays are integrated with the respectively associated passive structural elements on one and the same substrate, in particular a substrate with a high dielectric constant.

6. The mobile phone terminal as claimed in one of claims 2 to 5, characterized in that at least some of the micromotors are integrated with the respectively associated passive structural elements on one and the same substrate, in particular a substrate with a high dielectric constant.

7. The mobile phone terminal as claimed in one of the preceding claims, characterized in that the control unit (90) has

- a topology memory (90e) for storing the topology of the arrangement which determines the functional parameter or parameters and is composed of passive structural elements and microswitches or microrelays,
- an algorithm memory (90f) for storing a calculation algorithm for predetermined values of each functional parameter on the basis of topology elements, and
- a calculation stage (90d) for determining, on the basis of the stored calculation algorithm, the configuration microswitches or microrelays which are to be actuated in order to implement the predetermined value or the predetermined

values.

8. The mobile phone terminal as claimed in claim 7, characterized in that the topology memory (90e) is designed to store the position and a topology equivalent corresponding to the possible actuator stages of each micromotor, and the calculation stage (90d) is designed to calculate the actuation signal for each micromotor, which signal is to be output in order to implement a predetermined value of the functional parameter.

9. The mobile phone terminal as claimed in one of claims 1 to 7, characterized in that the control unit (C) has

- a configuration memory (M) which is embodied as a lookup table and has the purpose of storing a multiplicity of switched setting configurations of the microswitches or microrelays, in each case in an assignment to a value of a functional parameter or a values vector of a plurality of functional parameters, and
- a pointer stage (P) for addressing the configuration memory as a function of a programmable value or values vector.

10. The mobile phone terminal as claimed in claim 9, characterized in that the configuration memory (M) is designed to store combined switch setting and motor actuation configurations of a structural element arrangement in which not only microswitches or microrelays but also micromotors are provided for adjusting passive structural elements.

11. A method for operating a mobile phone terminal as claimed in one of the preceding claims, characterized in that, in each case before an actuation signal is transmitted to the microswitch configuration or microrelay configuration and optionally to a micromotor,

the transmitter stage and/or receiver stage (5; R/T) is deactivated.

12. The method as claimed in claim 11, characterized in that, in each case after the termination of a program run for setting one or more functional parameters, the transmitter stage and/or receiver stage (5; R/T) is automatically reactivated.

13. A method for operating a mobile phone terminal as claimed in one of claims 1 to 10, characterized in that the microswitches or microrelays which are to be actuated in order to implement the predetermined value or the predetermined values, and optionally micromotors, are determined in real time on the basis of a stored topology of the arrangement which determines the functional parameter or parameters and is composed of passive structural elements and microswitches or microrelays and a stored calculation algorithm for predetermined values of each functional parameter on the basis of topology elements.

14. A method for operating a mobile phone terminal as claimed in one of claims 1 to 10, characterized in that the determination of the microswitches or microrelays which are to be actuated in order to implement a predetermined value or predetermined values of each functional parameter, and optionally micromotors, by addressing a memory location of a configuration memory (M), embodied as a lookup table, in order to store a multiplicity of switched setting configurations of the microswitches or microrelays and optionally micromotors, is performed in each case in an assignment to a value of a functional parameter or a values vector of a plurality of functional parameters by means of a pointer stage (P) as a function of a currently programmed value or values vector.

15. A programmable RF block for mobile phone applications, having

- an active component (104, 105, 106),
- at least one mechanically tunable adapter network (101, 102, 103) which has individually adjustable passive components (107, 108, 109, 110, 111) and is connected to the active component (104, 105, 106), and
- a programmable control unit (117) which sets the mechanically tunable adapter network (101, 102, 103) in such a way that all the properties of the RF block relating to its signal response characteristic are predetermined.

16. The programmable RF block as claimed in claim 15, characterized in that each adjustable passive component (107, 108, 109, 110, 111) is assigned an electric micromotor (112, 113, 114, 115, 116), and the programmable control unit (117) actuates the micromotors (112, 113, 114, 115, 116) in order to set the mechanically tunable adapter network (101, 102, 103).

17. The programmable RF block as claimed in claim 16, characterized in that the micromotors (112, 113, 114, 115, 116) are activated only during the period of adjustment of the mechanically tunable adapter network (101, 102, 103), and outside this period the supply of electricity to the micromotors (112, 113, 114, 115, 116) is switched off.

18. The programmable RF block as claimed in one of the preceding claims, characterized in that a memory (118) is connected to the programmable control unit (117) in which setting values for the mechanically tunable adapter network (101, 102, 103) and/or

predetermined properties of the RF block relating to its signal response characteristic are permanently stored.

19. The programmable RF block as claimed in claim 18, characterized in that a table which represents the setting values, necessary to achieve a specific signal response characteristic of the RF block, for the mechanically tunable adapter network (101, 102, 103) is created in the memory (118).

20. The programmable RF block as claimed in one of the preceding claims, characterized in that the programmable control unit (117) sets the RF block with respect to its properties relating to the operating frequency, bandwidth, amplification power and/or noise characteristics.

21. The programmable RF block as claimed in one of the preceding claims, characterized in that the programmable control unit (117) itself calculates the setting values, necessary to achieve a specific signal response characteristic of the RF block, for the mechanically tunable adapter network (101, 102, 103).

22. The programmable RF block as claimed in one of the preceding claims, characterized in that the control unit (117) can be programmed over an air interface (124).

23. A mobile phone, characterized

in that it can be programmed over an air interface (124) and has a RF block as claimed in one of claims 15 to 22.

24. A programmable filter circuit for mobile phone applications, having:

- a plurality of passive components (204, 205) whose characteristic values are each mechanically adjustable,
- electric micromotors (208) for mechanically adjusting the passive components (204, 205), and
- a programmable control unit (217) for actuating the electric micromotors (208) in such a way that the filter circuit (201, 202, 203) has a specific characteristic curve.

25. The filter circuit as claimed in claim 24, characterized in that the control unit (217) is connected to a memory (218) in which setting values of the passive components (204, 205) or actuation values for the corresponding electric micromotors (208) and/or characteristic curves of the filter circuit (201, 202, 203) are stored.

26. The filter circuit as claimed in one of claims 24 or 25, characterized in that the control unit (217) itself calculates the actuation values for the electric micromotors (208) which are to be transmitted in order to achieve a specific characteristic curve of the filter circuit (201, 202, 203).

27. The filter circuit as claimed in one of claims 24 to 26, characterized in that some of the passive components are capacitors (204, 204') which have a mechanically adjustable capacitance and which are constructed with a high dielectric constant using a ceramic technology.

28. The filter circuit as claimed in claim 27, characterized in that the capacitors (204, 204') have rotatable or slidable metal plates (211).

29. The filter circuit as claimed in one of claims 24 to 28, characterized in that some of the passive components are resonators (205), it being possible to change the position of a short-circuit conductor (215) with respect to a grounding point (212) by means of the corresponding electric micromotor (208) in order to mechanically adjust the characteristic values of the resonators (205).

30. The filter circuit as claimed in one of claims 24 to 29, characterized in that the electric micromotors (208) are electrically supplied with power only during the period in which a corresponding passive component (204, 205) is being mechanically adjusted.

31. A programmable duplexer for mobile phone applications, having a plurality of programmable filter circuits as claimed in one of claims 24 to 30.

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